QB365 - Question Bank Software

October Month Syllabus - Study Materials

9th Standard

Maths

Multiple Choice Question

1) If p(a)= 0 then (x-a) is a __________ of p(x)
(a) divisor(b) quotient(c) remainder**(d) factor**

2) Zeros of (2-3x) is __________
(a) 3(b) 2**(c) 2/3**(d) 3/2

3) If one of the factors of x^2-6x-16 is x - 8 then the other factor is
(a) (x + 6)(b) (x - 2)**(c) (x + 2)**(d) (x -16)

4) In an expression ax^2+bx c the sum and product of the factors respectively,
(a) a, bc**(b) b, ac**(c) ac, b(d) bc, a

5) If (x + 5) and (x - 3) are the factors of ax^2+bx+c, then values of a, b and c are
(a) 1,2,3(b) 1,2,15**(c) 1,2, −15**(d) 1, −2,15

6) Cubic polynomial may have maximum of __________ linear factors
(a) 1(b) 2**(c) 3**(d) 4

7) Degree of the constant polynomial is __________
(a) 3(b) 2(c) 1**(d) 0**

8) GCD of any two prime numbers is __________
(a) -1(b) 0**(c) 1**(d) 2

9) If there are 36 students of class 9 and 48 students of class 10, what is the minimum number of rows to arrange them in which each row consists of same class with same number of students
(a) 12(b) 144**(c) 7**(d) 72

10) Which of the following statement is true for the equation 2x + 3y = 15
(a) the equation has unique solution (b) the equation has two solution (c) the equation has no solution **(d) the equation has infinite solutions**

11) Which of the following is a linear equation
(a) $x+\frac{1}{x}=2$ (b) x(x −1) = 2**(c) 3x+5=$\frac{2}{3}$**(d) x^3 - x =5

12) Which of the following is a solution of the equation 2x − y = 6
(a) (2,4)**(b) (4,2)**(c) (3, −1)(d) (0,6)

13) Which of the following is not a linear equation in two variable
(a) ax + by + c = 0**(b) 0x + 0y + c = 0**(c) 0x + by + c = 0(d) ax + 0y + c = 0

14) The value of k for which the pair of linear equations 4x + 6y −1 = 0 and 2x + ky − 7 = 0 represents parallel lines is
(a) k = 3(b) k = 2(c) k = 4(d) k = -3

15) If $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$ where $a_1x + b_1y + c_1 = 0$ and $a_2x + b_2 y + c_2 = 0$ then the given pair of linear equation has ________ solution(s)

(a) no solution(b) two solutions**(c) unique**(d) infinite

2 Marks

16) Show that (x+2) is a factor of x^3-4x^2-2x+20

Answer : Let p(x)=x^3-4x^2-2x+20

By factor theorem, (x+2) is factor of p(x), if p(-2) = 0

p(-2)=$(-2)^3$-4$(-2)^2$-2(-2)+20 {To find the zero of x+2; put x+2=0, we get x=-2}

=-8-4(4)+4+20

p(-2)=0

Therefore, (x+2) is a factor of x^3-4x^2-2x+20

17) Simplify: (2a+3b+4c)(4a^2+9b^2+16c^2-6ab-12bc-8ca)

Answer : We know that

(a+b+c)(a^2+b^2+c^2-ab-bc-ca)=a^3+b^3+c^3x3abc

∴ (2a+3b+4c)(4a^2+9b^2+16c^2-6ab-12bc-8ca)=$(2a)^3$+$(3b)^3$+$(4c)^3$-3x2ax3bx4c

=8a^3+27b^3+64c^3-72abc

18) Factorise the following: x^2+4y^2+9z^2-4xy+12yz-6xz

Answer : x^2+4y^2+9z^2-4xy+12yz-6xz

=$(-x)^2$+$(2y)^2$+$(3z)^2$+2(-x)(2y)+2(2y)(3z)+2(3z)(-x)

=$(-x+2y+3z)^2$ (or) $(x-2y-3z)^2$

19) Factorise the following: x^2+4x+4

Answer : x^2+4x+4=(x+2)(x+2)=$(x+2)^2$

∵ $(a+b)^2$≡a^2+2ab+b^2

20) Factorise the following: $\frac{1}{x^2}+\frac{4}{y^2}+\frac{9}{z^2}+\frac{4}{xy}+\frac{12}{yz}+\frac{6}{xz}$

Answer : $=(\frac{1}{x})^2+(\frac{2}{y})^2+(\frac{3}{2})^2+2(\frac{1}{x})(\frac{2}{y})+2(\frac{2}{y})(\frac{3}{z})+2(\frac{3}{2})(\frac{1}{x})=(\frac{1}{x}+\frac{2}{y}+\frac{3}{z})$

21) Give any two examples for linear equations in one variable.

Answer : y = 5x + 2, y = 10 +2x

22) The sum of a two digit number and the number formed by interchanging the digits is 110. If 10 is subtracted from the first number, the new number is 4 more than 5 times the sums of the digits of the first number. Find the first number.

Answer : Let the two digit number be x y

Its place value = 10x +y

After interchanging the digits the number will be y x

Its place value = 10y + x

Their sum =10x +y + 10y + x = 110

11x + 11y = 110

x +y = 10 ----- (1)

If 10 is subtracted from the first number, the new number is 10x +Y - 10

The sums of the digits of the first number is x +y.

Its 4 more than 5 times is= 5(x +y) + 4

10x+y-10 = 5x+5y+4

10x+y-5x-5y =4+ 10

5x-4y = 14 ....(2)

(10 X5 ⇒ 5x+5y=50

(2) $\Rightarrow \dfrac{5x-4y=14}{9y=36}$

$y = \dfrac{36^{4}}{9} = 4$

Substitute y = 4 in (1)

x+4 = 10

x = 10 - 4

x = 6

∴ The first number is 64

23) Points A and B are 70 km apart on a highway. A car starts from A and another car starts from B simultaneously. If they travel in the same direction, they meet in 7 hours, but if they travel towards each other, they meet in one hour. Find the speed of the two cars.

Answer : Let the speed of ihe car starts from A is x

Let the speed of the car starts from B is y

When they are moving in same direction, the speed is x - y.

7(x - y) = 70· [∵ Speed x Time = Distance]

x - y = 10 ---------- (1)

When they are moving towards each other,the speed is x +y.

1(x+y) = 70

x +Y = 70. ---------- (2)

(I) ⇒ x-y = 10

(2) $\Rightarrow \dfrac{x+y=70}{2x=80}$

x = 40

Substitute x = 40 in (I)

40 -y = 10

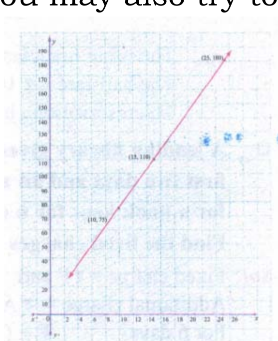
. y = 40 -10

y = 30

∴ The speed of the car from A is 40 kmIhr and the speed of the car from B is 30km/hr

24) The taxi charges in a city comprise of a fixed charge together with the charge for the distance covered. For a journey of 10 km the charge paid is Rs 75 and for a journey of 15 km the charge paid is Rs 110. What will a person have to pay for travelling a distance of 25 km? (You may also try to illustrate through a graph).

Answer :



Let the fixed charge of a taxi be ~x and the charge per km be Rs.y

According to the given conditions,

$\therefore$ x + 10y = 75 ---------- (1)

x + 15y = 110 ---------- (2)

(1) $\Rightarrow$ x+10y = 75

(2) $\Rightarrow \frac{x+15y=110}{-5y=-35}$

y = 7

Substitute y = 7 in (1)

x + 10(7) = 75

x+ 70 = 75

x = 75 -70 = 5

$\therefore$Amount that a person will have to pay for travelling a distance of 25 km

x + 25y = 5 + 25 (7)

= 5 + 175

= Rs.180

$\therefore$ Amount that a person will have to pay for travelling a distance of 25 km is Rs.180.

25) A lending library gives books on rent for reading. It takes a fixed charge for the first two days and an additional charge for each day thereafter. Latika paid Rs 22 for a book kept for 6 days, while Anand paid Rs 16 for the book kept for 4 days. Find the fixed charges and the charge for each extra day.

Answer : Fixed charge = Rs.F and

Additional charge = Rs.A

For 6 days F+(6-2)A = 22

F + 4 A = 22 ...91)

For 4 days

F+(4-2)A = 22

F+2A=16 ...(2)

(1) $\Rightarrow$ F+4A = 22

(2) $\Rightarrow \frac{F+2A=16}{2A=6}$

$\therefore$ Substitute A = 3 in (1)

F + 4(3) = 22

F = 22 -12

F = 10

$\therefore$ Fixed charge = Rs.10

Additional charge = Rs.3

3 Marks

26) Is (3x-2) a factor of $3x^2+x^2-20x+12$?

Answer : Let p(x) = $3x^2+x^2-20x+12$

By factor theorem, (3x -2) is a factor, if $p\left(\frac{2}{3}\right)=0$

$p\left(\frac{2}{3}\right)=3\left(\frac{2}{3}\right)^3+\left(\frac{2}{3}\right)^2-20\left(\frac{2}{3}\right)+12$

{To find the zero of 3x-2; put 3x-2=0

3x=2

we get $x=\frac{2}{3}$}

$=3\left(\frac{8}{27}\right)+\left(\frac{4}{9}\right)-20\left(\frac{2}{3}\right)+12$

$=\frac{8}{9}+\frac{4}{9}-\frac{120}{9}+\frac{108}{9}$

$=\frac{(120-120)}{9}$

$p\left(\frac{2}{3}\right)=0$

Therefore,(3x -2) is a factor of

$3x^2+x^2-20x+12$

27) Is (2x -3) a factor of $p(x)=2x^3-9x^2+x+12$?

Answer : Let $P(x)=2x^3-9x^2+x+12$

By factor theorem,

(2x-3) is a factor of P(x), if $P(\frac{3}{2})=0$

$P(\frac{3}{2})=2(\frac{3}{2})^3-9(\frac{3}{2})^3+\frac{3}{2}+12$

$= 2\left(\frac{27}{8}\right)-9\left(\frac{9}{4}\right)+\frac{3}{2}+12=\frac{27}{4}-\frac{81}{4}+\frac{3}{2}+12=\frac{27-81}{4}+\frac{3}{2}+12$

$=\frac{54}{4}+\frac{3}{2}+12=\frac{-27}{2}+\frac{3}{2}+12=\frac{-27}{2}+\frac{3+24}{2}=\frac{-27}{2}+\frac{27}{2}=0$

∴ (2x-3) is a factor of $P(x)=2x^3-9x^2+x+12$

28) Find the area of square whose side length is 3m +2n −4l.

Answer : Area of square = side x side

=(3m +2n −4l) x (3m +2n −4l) [substituting a=3m, b=2n, c=-4l]

$=(3m+2n-4l)^2$

We know that, $(a+b+c)^2 = a^2+b^2+c^2+2ab+2bc+2ca$

$[3m+2n+(-4l)]^2 = (3m)^2+(2n)^2+(-4l)^2+2(3m)(2n)(-4l)+2(-4l)(3m)$

$=9m^2+4n^2+16l^2+12mn-16ln-24lm$

Therefore, Area of square $=[9m^2+4n^2+16l^2+12mn-16ln-24lm]$ sq.units.

29) If $\left(y-\frac{1}{y}\right)^3=27$, then find the value of $y^3-\frac{1}{y^3}$.

Answer : $(y-\frac{1}{y})^3=27(Given)$

$y^3-\frac{1}{y^3}=(y-\frac{1}{y})^3+3y+\frac{1}{y}(y-\frac{1}{y})$

$\because x^3-y^3\equiv(x-y)^3+3xy(x-y)$

$=27+3(y-\frac{1}{y})$

$\because (y-\frac{1}{y})^3=27; y-\frac{1}{y}=\sqrt[3]{27}=3$

=27+3x3=27+9=36

30) (i) Prove that (x -1) is a factor of $x^3-7x+13x-7$

(ii) Prove that (x + 1) is a factor of $x^3+7x^2+13x+7$

Answer : (i) Let $p(x)x^3-7x+13x-7$

Sum of coefficients =1−7+13−7=0

Thus (x -1) is a factor of p x ( )

(ii) Let $q(x) = x^3+7x^2+13x+7$

Sum of coefficients of even powers of x with constant = 7 + 7 = 14

Sum of coefficients of odd powers of x = 1 + 13 = 14

Hence, (x + 1)is a factor of q (x)

31) (Computing slope made easier!) Find the slope and y-intercept of the line given by the equation 2y – 3x = 12.

Answer : The given equation is 2y – 3x = 12

$\Rightarrow$ 2y = +3x + 12

$\Rightarrow \quad \frac{2y}{2} = \frac{3x+12}{2}$

$\Rightarrow \quad y = \frac{3x}{2} + \frac{12}{2}$

$\Rightarrow \quad y = \frac{3}{2}x + 6$

compare with, y=mx + c

Slope m = $\frac{3}{2}$, y-intercept c = 6

32) Check whether (5, −1) is a solution of the simultaneous equations x – 2y = 7 and 2x + 3y = 7.

Answer : Given x – 2y = 7 ...(1)

2x + 3y = 7 ...(2)

When x = 5, y = −1 we get

From (1) x – 2y = 5 – 2(−1) = 5 + 2 = 7 which is RHS of (1)

From (2) 2x + 3y = 2(5) + 3(−1) = 10−3 = 7 which is RHS of (2)

Thus the values x = 5, y = −1 satisfy both (1) and (2) simultaneously. Therefore (5,−1) is a solution of the given equations.

33) Solve the system of linear equations x + 3y = 16 and 2x − y = 4 by substitution method.

Answer : Given x + 3y = 16 ... (1)

2x – y = 4 ... (2)

Step 1	**Step 2**	**Step 3**	**Solution**
From equation (2) 2x −y = 4 –y = 4–2x y = 2x − 4 ...(3)	Substitute (3) in (1) x + 3y = 16 x + 3(2x − 4) = 16 x + 6x −12 = 16 7x = 28 x = 4	Substitute x = 4 in (3) y = 2x − 4 y = 2(4) − 4 y = 4	x = 4 and y = 4

34) Solve by cross-multiplication method

(i) 8x − 3y = 12 ; 5x = 2y + 7

(ii) 6x + 7y −11 = 0 ; 5x + 2y = 13

(iii) $\frac{2}{x} + \frac{3}{y} = 5; \frac{3}{x} - \frac{1}{y} + 9 = 0$

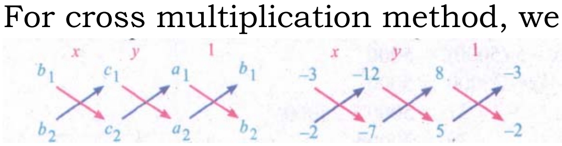
Answer : (i) 8x- 3y.=12 ...(1)

5x-2y= 7 ..(2)

8x- 3y-12 = 0

5x-2y- 7 = 0

For cross multiplication method, we write the co-efficients as



$$\frac{x}{(-3)(-7)(-2)(-12)} = \frac{y}{(-12)(5) - (-7)(8)} = \frac{1}{(8)(-2) - (5)(-3)}$$

$$\frac{x}{21-24}=\frac{y}{-60+56}=\frac{1}{-16+15}$$

$$\frac{x}{-3}=\frac{y}{-60+56}=\frac{1}{-16+15}$$

$$\therefore \quad \frac{x}{3}=\frac{1}{-1} \qquad \frac{y}{-4}=\frac{1}{-1}$$

-x = -3 , y= -4

∴ Solutions: x = 3; y = 4

(ii) 6x+ 7y-11= 0

5x+ 2y-13 = 0

For cross multiplication method, we write the co-efficients as

$$\frac{x}{-91-(-22)}=\frac{y}{-55-(-68)}=\frac{1}{12-35}$$

$$\frac{x}{-91+22}=\frac{y}{-55+78}=\frac{1}{-23}$$

$$\frac{x}{-69}=\frac{y}{23}=\frac{1}{-23}$$

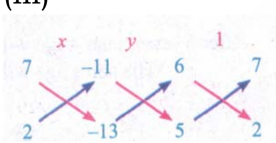
$$\frac{x}{-69}=\frac{1}{-23} \qquad \frac{y}{23}=\frac{1}{-23}$$

$$x=\frac{\not{-}69^{3}}{\not{-}23} \qquad y=\frac{23^{1}}{-23}$$

x = 3, y= -1

∴ Solution x = 3 ;y= -1

(iii)



$$\frac{2}{x}+\frac{3}{y}-5=0$$

$$\frac{3}{x}-\frac{1}{y}+9=0$$

In (1), (2) Put $\frac{1}{x}=a, \frac{1}{y}=b$

(1) ⇒ 2a+3b -5 =0

(2) ⇒ 3a-b+9 = =0

For cross multiplication method, we write the co-efficients as

$$\frac{a}{(3)(9)-(-1)(-5)}=\frac{b}{(-5)(3)-(9)(2)}=\frac{1}{(2)(-1)-(3)(3)}$$

$$\frac{a}{27-5}=\frac{b}{-15-18}=\frac{1}{-2-9}$$

$$\frac{a}{22}=\frac{b}{-33}=\frac{1}{-11}$$

$$\therefore \quad \frac{a}{22}=\frac{1}{-11}\ \frac{b}{-33}=\frac{1}{-11}$$

$$x=\frac{-69^{3}}{-23} \qquad y=\frac{23^{1}}{-23}$$

a= -2 b= 3

$$a=\frac{1}{x}=-2 \quad b=\frac{1}{y}=3$$

$$\therefore \quad x=-\frac{1}{2} \qquad y=\frac{1}{3}$$

solution $x=-\frac{1}{2} \qquad y=\frac{1}{3}$

35) Find the value of k for which the given system of equations kx + 2y = 3; 2x − 3y = 1 has a unique solution.

Answer : Given linear equations are

kx + 2y = 3 ......(1)

2x - 3y = 1 ....(2)

$$\begin{bmatrix} a_1x+b_1y+c_1=0 \\ a_2x+b_2y+c_2=0 \end{bmatrix}$$

Here a_1 = k, b_1 = 2, a_2 = 2, b_2 = −3 ;

For unique solution we take $\frac{a_1}{a_2} \neq \frac{b_1}{b_2}$;therefore $\frac{k}{2} \neq \frac{2}{-3}$;$k \neq \frac{4}{-3}$, that is $k \neq -\frac{4}{3}$

5 Marks

36) If a = 4, b = 5 and c = 6 , then find the value of $\left[\frac{(ab+bc+ca-a^2-b^2-c^2)}{(3abc-a^3-b^3-c^3)}\right]$.

Answer : $\frac{1}{15}$

37) Find the GCD of the following:

(i) (2x+5), (5x+2)

(ii) a^{m+1}, a^{m+2}, a^{m+3}

(iii) $2a^2+a$, $4a^2-1$

(iv) $3a^2$, $5b^3$, $7c^4$

(v) x^4-1, x^2-1

(vi) a^3-9ax^2, $(a-3x)^2$

Answer : (i) (2x+5), (5x+2)

(2x+5)=1x(2x+5)

(5x+2)=1x(5x+2)

∴ G.C.D=1

(ii) a^{m+1}, a^{m+2},a^{m+3}

$a^{m+1}=a^m x a^1$

$a^{m+2}=a^m x a^1 x a^1$

$a^{m+3}=a^m x a^1 x a^1 x a^1$

G.C.D=$a^m x a^1 = a^{m+1}$

(iii) $2a^2+a$, $4a^2-1$

$2a^2+a=a(2a+1)$

$4a^2-1=(2a)^2-1^2=(2a+1)(2a-1)$

G.C.D=(2a+1)

(iv) $3a^2, 5b^3, 7c^4$

$3a^2=1xaxa$

$5b^3=1x5bxbxb$

$7c^4=1x7cxcxcxc$

∴ G.C.D=1

(v) x^4-1, x^2-1

$x^4-1=(x^2)^2-1^2=(x^2+1)(x^2-1)$

$=(x^2+1)(x^2-1^2)=(x^2+1)(x+1)(x-1)$

$x^2-1=x^2-1^2=(x+1)(x-1)$

G.C.D=$(x+1)(x-1)=x^2-1$

(vi) a^3-9ax^2, $(a-3x)^2$

$a^3-9ax^2=a(a^2-(3x)^2)=a(a+3x)(a-3x)$

$(a-3x)^2=(a-3x)(a-3x)$

G.C.D=(a-3x)

38) Factorise $2x^2-15x+27$

Answer : Compare with ax^2+bx+c

we get, a=2, b=-15, c=27

product ac = 2 x 27 = 54 and sum b = -15

∴ we split the middle term as -6x and -9x

Product of factors ac=54	Product of factors b=-15	Product of factors ac=54	Product of factors b=-15
1 x 54	55	-1 x -54	-55
2 x 27	29	-2 x -27	-29
3 x 18	21	-3 x -18	-21
6 x 9	15	-6 x -9	-15

The required factors are -6 and -9

$2x^2-15x+27=2x^2-6x-9x+27$

=2x(x-3)-9(x-3)

=(x-3)(2x-9)

Therefore, (x-3) and (2x-9) are the factors of $2x^2-15x+27$

39) Factorise the following:

(i) $(p-q^2)-6(p-q)-16$

(ii) $9(2xy)^2-4(2x-y)-13$

(iii) $m^2+2mm-24n^2$

(iv) $\sqrt{5}a^2+2a-3\sqrt{5}$

(v) a^4-2a^2+2

(vi) $8m^3-2m^2n-15mn^2$

(vii) $4\sqrt{3}x^2+5x-2\sqrt{3}$

(viii) a^4-7a^2+1

(ix) $a^2+\frac{1}{a^2}-18$

(x) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{2}{xy}$

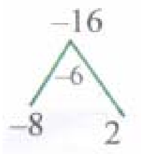
(xi) $\frac{3}{x^2}+\frac{8}{xy}+\frac{4}{y^2}$

Answer : (i) $(p-q)^2-6(p-q)-16$

$=(p-q)^2-8(p-q)+2(p-q)-16$

$=(p-q)((p-q)-8)+2((p-q)-8)$

$=(p-q-8)(p-q+2)$



(ii) $9(2x-y)^2-4(2x-y)-13$

Here put $(2x-y)=a$

Then $9(2x-y)^2-4(2x-y)-13=9a^2-4a-13$

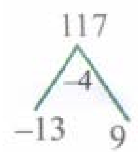
$=9a^2+9a-13a-13$

$=9a(a+1)-13(a+1)$

$=(a+1)(9a-13)$

$=(2x-y+1)(9(2x-y)-13)$

$=(2x-y+1)(18x-9y-13)$

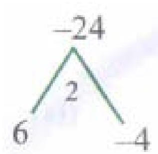


(iii) $m^2+2mn-24n^2$

$=m^2+6mn-4mn-24n^2$

$=m(m+6n)-4n(m+6n)$

$=(m+6n)(m-4n)$

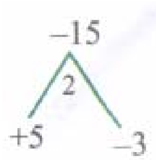


(iv) $\sqrt{5}a^2+2a-3\sqrt{5}$

$=\sqrt{5}a^2+2a-3\sqrt{5}$

$=\sqrt{5}a(a+\sqrt{5})-3(a+\sqrt{5})$

$=(a+\sqrt{5})(\sqrt{5}a-3)$

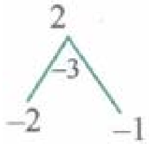


(v) a^4-3a^2+2

$=a^4-2a^2-1a^2+2$

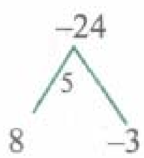
$=a^2(a^2-2)-1(a^2-2)$

$=(a^2-2)(a^2-1)=(a^2-2)(a+1)(a-1)$



(vi) $8m^3-2m^2n-15mn^2$
$=m(8m^2-2mn-15n^2)$
$=m(8m^2-12mn+10mn-15n^2)$
$=m(4m(2m-3n)+5n(2m-3n))$
$=m(4m+5n)(2m-3n)$

(vii) $4\sqrt{3}x^2+5x-2\sqrt{3}$
$=+4\sqrt{3}x^2+8x-3x-2\sqrt{3}$
$=+4\sqrt{3}x^2+8x-3x-2\sqrt{3}$
$=4x(\sqrt{3}x+2)-\sqrt{3}(\sqrt{x}+2)$
$=(\sqrt{3}x+2)(4x-\sqrt{3})$



(viii) a^4-7a^2+1
$=(a^2+1)^2-2a^2-7a^2=(a^2+1)^2-9a^2=(a^2+1)^2-(3a)^2$
$=(a^2+3a+1)(a^2-3a+1)$
(ix) $a^2+\frac{1}{a^2}-18$
$=\left(a-\frac{1}{a}+4\right)\left(a-\frac{1}{a}-4\right)$
(x) $\frac{1}{x^2}+\frac{1}{y^2}+\frac{2}{xy}$
$=(\frac{1}{x})^2+2(\frac{1}{x})(\frac{1}{y})+(\frac{1}{y})^2$
$=\left(\frac{1}{x}+\frac{1}{y}\right)^2$
(xi) $\frac{3}{x^2}+\frac{8}{xy}+\frac{4}{y^2}$
$=\frac{3y^2+8xy+4y^2}{x^2y^2}=\frac{1}{x^2y^2}[3y^2+6xy+2xy+4x^2]$
$=\frac{1}{x^2y^2}[3y(y+2x)+2x(y+2x)]$
$=\frac{1}{x^2y^2}(y+2x)(3y+2x)=(\frac{y+2x}{xy})(\frac{3y+2x}{xy})$
$=(\frac{1}{x}+\frac{2}{y})(\frac{3}{x}+\frac{2}{y})$

40) Factorise each of the following polynomials using synthetic division:
(i) $x^3-3x^2 10x+24$
(ii) $2x^3-3x^2-3x+2$
(iii) $4x^3+5x^2+7x-6$

(iv) $-7x+3+4x^3$

(v) $x^3+x^2 14x-24$

(vi) x^3-7x+6

(vii) x^3-10x^2-x+10

(viii) x^3-5x+4

Answer : (i) $x^3 - 3x^2 - 10x + 24$

Let $p(x)=x^3 - 3x^2 - 10x + 24$

Sum of all the co-efficients = 1- 3 - 10 + 24 = 25 -13 = 12 ≠ 0

Hence (x - 1) is not a factor.

Sum of co-efficient of even powers with constant = -3 + 24 = 21

Sum of co-efficients of odd powers = 1 - 10 = - 9

21≠-9

Hence (x + 1) is not a factor.

$p(2) = 2^3+-3(2^2)-10x2+24=8-12-20+24$

= 32 - 32 = 0 ∴ (x - 2) is a factor.

Now we use synthetic division to find other factor

2	1	–3	–10	24
	0	2	–2	–24
–3	1	–1	–12	0
	0	–3	12	
	1	–4	0	

Thus (x - 2) (x + 3) (x - 4) are the factors.

∴ $x^3 - 3x^2 - 10x + 24 = (x - 2)(x + 3)(x - 4)$

(ii) $2x^2 - 3x^2 - 3x + 2$

Let $p(x) = 2x^3 - 3x^2 - 3x + 2$

Sum of all the co-efficients are

2-3-3+2 = 4-6=-2≠0

∴ (x - 1) is not a factor.

Sum of co-efficients of even powers of x with constant = -3 + 2 = - 1

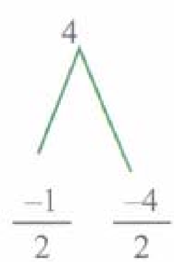
Sum of co-efficients of odd powers of x = 2 - 3 = - 1

(-1) = (-1)

∴ (x+ 1) is a factor

Let us find the other factors using synthetic division

–1	2	–3	–3	2
	0	–2	5	–2
	2	–5	2	0



Quotient is $2x^2-5x+2=2x - 4x - x + 2 = 2x (x - 2) - 1 (x - 2)$

=(x - 2)(2x - 1)

∴ $2x^3-3x^2-3x+2=(x+1)(x-2)(2x-1)$

(iii) $4x^3-5x^2+7x-6$

Let $p(x)=4x^3-5x^2+7x-6$

Sum of all the co-efficients are = 4 - 5 + 7 - 6 = 11 - 11 = 0

∴ (x - 1) is a factor

Sum of co-efficients of even powers of x with constant

-5-6 =-11

Sum of co-efficients of odd powers of x

4+7 = 11, -11≠11

∴ (x + 1) is not a factor

To find the other factors, using synthetic division

1	4	–5	7	–6
	0	4	–1	6
	4	–1	6	0

Quotient $4x^2-x+6$ cannot be split into factors.

Hence the factors are (x - 1) and $(4x^2 - x + 6)$

∴ $4x^3-5x^2+7x-6=(x-1)(4x^2-x+6)$

(iv) $-7x+3+4x^3$

Let $p(x)=4x^3+0x^2-7x+3$

Sum of the co-efficients are = 4 + 0 - 7 + 3

= 7-7=0

∴ (x - 1) is a factor

Sum of co-efficients of even powers of x with constant = 0 + 3 = 3

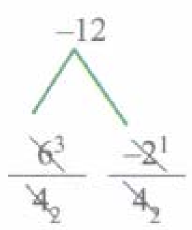
Sum of co-efficients of odd powers of x with constant = 4 - 7 =-3

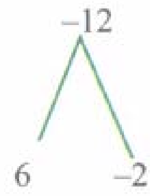
3≠-3

∴ (x + 1) is not a factor

Using synthetic division, let us find the other factors.

1	4	0	–7	3
	0	4	4	–3
	4	4	–3	0





Quotient is $4x^2+4x-3$
$=4x^2+6x-2x-3$
$=2x(2x+3)-1(2x+3)$
$=(2x+3)(2x-1)$
∴ The factors are (x -1), (2x + 3) and (2x - 1)
∴ $-7x+3+4x^3=(x+1)(2x+3)(2x-1)$
(v) $x^3 + x^2 - 14x - 24$
Let $p(x)=x^3 + x^2 - 14x - 24$
Sum of the co-efficients are $1 + 1-14-24=-36\neq0$
∴ (x - 1) is not a factor
Sum of co-efficients of even powers of x with constant = 1 - 24 = -23
Sum of co-efficients of odd powers of x = 1 - 14 = -3
$-23\neq-13$
∴ (x + 1) is also not a factor
$p(2)=2^3 + 2^2 - 14 (2) - 24 = 8 + 4 - 28 - 24$
$=12 - 52 \neq 0$, (x - 2) is a not a factor
$p(-2)=(-2)^3 + (-2)^2 - 14 (-2) - 24$
$-8 + 4 + 28 - 24 = 32 - 32 = 0$
∴ (x + 2) is a factor
To find the other factors let us use synthetic division
$x^3+x^2-14x-24$

–2	1	1	–14	–24
	0	–2	2	24
–3	1	–1	–12	0
	0	–3	12	
	1	–4	0	

∴ The factors are (x + 2),(x + 3),(x - 4)
∴ $x^3+x^2-14x-24=(x+2)(x+3)(x-4)$
(vi) $x^3- 7x + 6$
Let $p (x)=x^3+0x^2-7x+6$

Sum of the co-efficients are=1+0-7+6=7-7=0

∴ (x - 1) is a factor

Sum of co-efficients of even powers of x with constant = 0 + 6 = 6

Sum of coefficient of odd powers of x = 1 - 7 = - 7

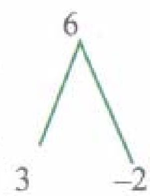
6≠-7

∴ (x + 1) is not a factor

To find the other factors, let us use synthetic division.

$x^3+x^2-14x-24$

–1	1	0	–7	6
	0	1	1	–6
2	1	1	–6	0
	0	2	6	
	1	3	0	



∴ The factors are (x - 1), (x - 2), (x + 3)

∴ $x^3+0x^2-7x+6=(x - 1)(x - 2)(x + 3)$

(vii) x^3-10x^2-x+10

Let $p(x)=x^3-10x^2-x+10$

Sum of the co-efficients=1-0-1+10

=11-11=0

:.(x - 1) is a factor

Sum of co-efficients of even powers of x with constant = -10 + 10 = 0

Sum of co-efficients of odd powers of = 1 - 1 = 0

∴ (x + 1) is a factor

Synthetic division

–1	1	–10	–1	10
	0	1	–9	–10
–1	1	–9	–10	0
	0	–1	10	
	1	–10	0	

∴ $x^3+10x^2-x+10=(x-1)(x+1)(x-10)$

(viii) $x^3 - 7x + 6$

Let $p(x) = x^3 - 5x + 4$

$= x^3 - 0x^2 - 5x + 4$

Sum of the co-efficients = 1 + 0 - 5 + 4 = 5 - 5 = 0

∴ (x - 1) is a factor

Sum of co-efficients of even powers of x with constant = 0 + 4 = 4

Sum of co-efficient of odd powers of x = 1 - 5 = - 4

4≠-4

∴ (x + 1) is not a factor

1	1	0	–5	4
	0	1	1	–4
	1	1	–4	0

Quotient is x^2+x-4

∴ $x^3-5x+4=(x-1)(x^2+x-4)$

41) Use graphical method to solve the following system of equations 3x + 2y = 6; 6x + 4y = 8

Answer : Let us form table of values for each line and then fix the ordered pairs to be plotted.

Graph of 3x + 2y = 6

x	-2	0	2
y	6	3	0

Points to be plotted:

(−2,6), (0,3), (2,0)

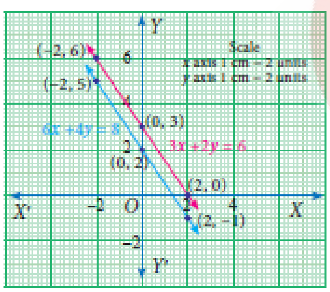
Graph of 6x + 4y = 8

x	-2	0	2
y	5	2	-1

Points to be plotted:

(-2,5), (0,2), (2,-1)

When we draw the graphs of these two equations, we find that they are parallel and they fail to meet to give a point of intersection. As a result there is no ordered pair that can be common to both the equations. In this case there is no solution to the system.



This could have been easily guessed even without drawing the graphs. Writing the two equations in the form y = mx + c.

Note that the slopes are equal

Therefore the lines are parallel and will not meet at any point and hence no solution exists.

42) Use graphical method to solve the following system of equations y = 2x + 1; −4x + 2y = 2

Answer : Let us form table of values for each line and then fix the ordered pairs to be plotted.

Graph of y = 2x + 1

Graph of -4x + 2y = 2

2y = 4x + 2

y = 2x + 1

x	-2	-1	0	1	2
2x	-4	-2	0	2	4
1	1	1	1	1	1
y=2x+1	-3	-1	1	3	5

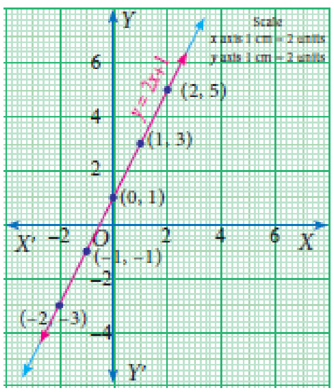
Points to be plotted : (−2, −3), (−1, −1), (0,1), (1,3), (2, 5)

x	-2	-1	0	1	2
2x	-4	-2	0	2	4
1	1	1	1	1	1
y=2x+1	-3	-1	1	3	5

Points to be plotted : (−2, −3), (−1, −1), (0, 1), (1, 3), (2, 5)

Here both the equations are identical; they were only represented in different forms. Since they are identical, their solutions are same. All the points on one line are also on the other!

This means we have an infinite number of solutions which are the ordered pairs of all the points on the line.



43) The perimeter of a rectangle is 36 metres and the length is 2 metres more than three times the width. Find the dimension of rectangle by using the method of graph.

Answer : Let us form equations for the given statement.

Let us consider l and b as the length and breadth of the rectangle respectively.

Now let us frame the equation for the first statement

Perimeter of rectangle = 36

2(l+b) = 36

$l+b=\frac{36}{2}$

l = 18-b .....(1)

b	2	4	5	8
18	18	18	18	18
-b	-2	-4	-5	-8
l=18-b	16	14	13	10

Points: (2,16), (4,14), (5,13), (8,10)

The second statement states that the length is 2 metres more than three times the width which is a straight line written as l = 3b + 2 ... (2)

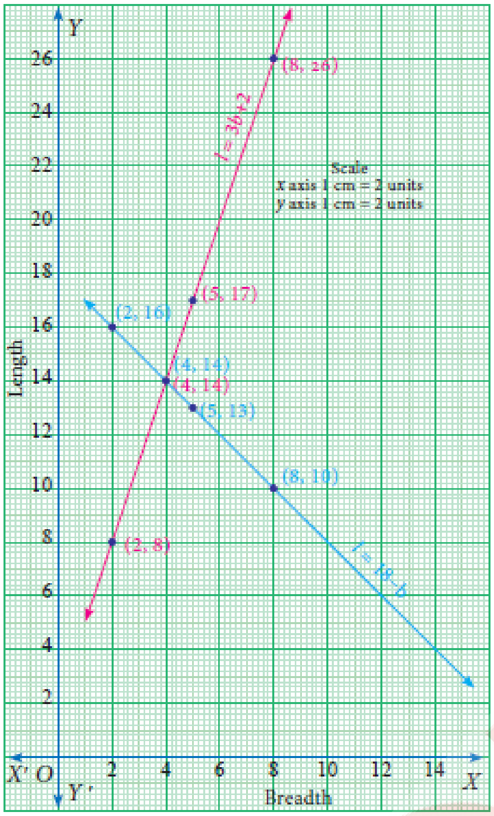
Now we shall form table for the above equation (2).

b	2	4	5	8
3b	6	12	15	24
2	2	2	2	2

l=3b+2	8	14	17	26

Points: (2,8), (4,14), (5,17), (8,26)

The solution is the point that is common to both the lines. Here we find it to be (4,14). We can give the solution to be b = 4, l = 14.



Verification :

2(l+b) = 36 ...(1)

2(14+4) = 36

$2 \times 18 = 36$

36 = 36 true

l = 3b + 2 ...(2)

14 = 3(4) +2

14 = 12 + 2

14 = 14 true

44) The sum of the digits of a given two digit number is 5. If the digits are reversed, the new number is reduced by 27. Find the given number.

Answer : Let x be the digit at ten's place and y be the digit at unit place.

Given that x + y = 5 ...... (1)

	Tens	**Ones**	**Value**
Given Number	x	y	10x+y
New Number (after reversal)	y	x	10y + x

Given, Original number − reversing number = 27

(10x + y) − (10y + x) = 27

10x − x + y −10y = 27

9x − 9y = 27

$\Rightarrow$ x − y = 3 ... (2)

Also from (1), y = 5 – x … (3)
Substitute (3) in (2) to get x − (5 − x) = 3
x − 5 + x = 3
2x = 8
x = 4
Substituting x = 4 in (3), we get y = 5 − x = 5 − 4
y = 1
Thus, 10x + y = 10 × 4 +1 = 40 +1 = 41.
Therefore, the given two-digit number is 41.
Verification :
sum of the digits = 5
x + y = 5
4 + 1 = 5
5 = 5 true
Original number – reversed number = 27
41 - 14 = 27
27 = 27 true

45) Check whether the following system of equation is consistent or inconsistent and say how many solutions we can have if it is consistent.
(i) 2x – 4y = 7
x – 3y = –2
(ii) 4x + y = 3
8x + 2y = 6
(iii) 4x +7 = 2 y
2x + 9 = y

Answer :

SI.No	Pair of lines	$\frac{a_1}{a_2}$	$\frac{b_1}{b_2}$	$\frac{c_1}{c_2}$	Compare the ratios	Graphical representation	Algebraic interpretation
(i)	2x–4y = 7 x – 3y = –2	$\frac{2}{1}=2$	$\frac{-4}{-3}=\frac{4}{3}$	$\frac{7}{-2}=\frac{-4}{2}$	$\frac{a_1}{a_2}\neq\frac{b_1}{b_2}$	Intersecting lines	Unique solution
(ii)	4x + y = 3 8x + 2y = 6	$\frac{4}{8}=\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{6}=\frac{1}{2}$	$\frac{a_1}{a_2}=\frac{b_1}{b_2}=\frac{c_1}{c_2}$	Coinciding lines	Infinite many solutions
(iii)	4x + 7= 2y 2x + 9 = y	$\frac{4}{2}=2$	$\frac{2}{1}=2$	$\frac{7}{9}$	$\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}$	Parallel lines	No solution